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A DISTINCTIVE ARCHITECTURAL TECHNIQUE IN THE CONSTRUCTION OF RELIGIOUS STRUCTURES IN CENTRAL ASIA

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SUMMARY

A survey of the various styles of architecture used in the construction of religious buildings in Central Asia, with particular emphasis on historical, cultural, and technological values. Through archaeological and historical evidence, this study investigates how local craftsmanship integrated with external influence in developing some of the iconic religious buildings: mosques, madrasas, and mausoleums. In them, key elements of fresh construction of domes, detailed brickwork, and ornamental patterns have been analysed in terms of functional and aesthetic contributions. They underline that, besides reflecting the spiritual and socio-economic values of the time, they indeed exemplify the high engineering and artistic skills of Central Asian builders. The present study contributes a lot to the region's architectural heritage and shows their continuing influence upon Islamic art and architecture.

Key words: *central asia, religious architecture, dome construction, brickwork techniques, islamic art, architectural heritage, mosque design, madrasas, mausoleums, cultural influence, historical construction methods, decorative patterns.*

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INTRODUCTION

For a long time, Central Asia has been the crossroads of culture, religion, and civilizations, befitting its central location along the Silk Road between East and West. This geographical and culturally strategic

positioning has left a deep mark on the architectural heritage in the region, which is exceptionally visible in its religious buildings. Its mosques, madrasas, and mausoleums are living testimony to the brilliant synthesis of influences in Persian and Islamic architectural styles with elements adopted from the Chinese and local traditions.

They turned the linked religious architecture with functionality and artistic expression. The builders in Central Asia had to be very inventive and resourceful, creating some of the latest technologies to overcome odds such as seismic activity and arid climates. Thus, buildings of great structure were able to be built: like symbols, representing both the spiritual and cultural heritages of the domes, complicated brickworks, and the bright tile mosaics became.

But these architectural achievements carry meanings far beyond the physical. In many ways, the religious buildings of Central Asia served not only as places of worship but also as centers of learning and community, where the intellectual and cultural development of society intersected. The way of construction testifies to profound knowledge in the field of materials, geometry, and symbols, a mirror of the spiritual and social values of that time.

The paper describes basic architectural technologies of the religious buildings in Central Asia, their historical, structural, and aesthetic characteristics. These are contributions that delineate the place of this region in the development of Islamic architectural traditions and reveal its lasting heritage on the world stage. Central Asian religious architecture stands out as living testimony to the ingenuity and skill of its constructors; it saves a rich heritage that keeps on inspiring nothing but astonishment and scholarly inquiry [7, 10].

LITERATURE REVIEW

Numerous scholarly works enrich this area of Central Asian religious architecture by studying its cultural, artistic, and technical dimensions in development. The essay reviews major sources contributing to an understanding of architectural innovations and the historical significance of this unique heritage.

Blair and Bloom [1] provide a general overview of Islamic architecture during this formative period in *The Art and Architecture of Islam: 1250-1800*. Their analysis underlines the confluence of regional styles and technical ingenuity that defined Islamic art, rendering valuable insights into the aesthetic and functional aspects of religious structures in Central Asia.

Wilber et al., [2] discuss the Timurid Architecture of Iran and Turan in relation to the great architectural achievements during the Timurid period. Their work is on buildings such as Registan Square in Samarkand and brings a new light to the double-shelled domes, brilliant tile mosaics, and monumental gateways of that period.

Valentinovna [3] is the author of the history of Islamic architecture in Iran during the Timur and Timurid epoch. Her work focuses particularly on the artistic imagery and symbolic depth of architectural designs. It reveals spiritually and culturally encoded messages in Timurid architecture, contributing to understanding its everlasting heritage.

Hakimov et al., [4] discuss in detail the technical development behind these architectural feats of the Islamic world through the book *Mechanical Marvels: Innovations in Engineering During the Islamic Golden Age*. Their findings on engineering innovations provide context for the structural stability and resilience of the religious buildings in Central Asia.

Necipoğlu, [5] in her analysis of *Geometric Design in Timurid/Turkmen Architectural Practice*, goes into great detail regarding the complicated use of geometry and its parallel with the late Gothic traditions. Her work points out the immense cultural exchange and depth of intellect in Timurid architectural practices.

Crane [6] reviews *Architecture of the Islamic World, Its History and Social Meaning*, edited by George Michell. The review addresses social and cultural aspects that provide a context for understanding Islamic architecture. This book puts Central Asian religious buildings in the general perspective of Islamic architectural traditions.

Starr [8] chronicles that era in his book entitled *Lost Enlightenment: Central Asia's Golden Age from the Arab Conquest to Tamerlane*, where architectural strides can be related to intellectual and cultural florescence in the land. His exploration of the relationship between science, culture, and architecture gives more dimension in understanding Central Asia's golden age.

Karimov et al., [9] in the book *Historical Development of Construction Techniques: From Ancient Architecture to Modern Engineering, 2024*, follow the historical development of construction techniques. Their discussion on basic construction techniques provides insights into the structural and environmental adaptation used in Central Asia.

Together, these sources form a strong base from which to analyze the peculiarities of architectural techniques and the cultural value of Central Asian religious buildings. They all point out the region's importance as a center of artistic innovation and its lasting influence on world architectural traditions.

HISTORICAL CONTEXT

Its architecture matured during the medieval Islamic period—that is, with the passing of some dozen centuries under strong and dynasty-based rulers like the Samanids, the Timurids, and the Seljuks. Such eras are remembered as the golden age of development in culture and the arts; in this monumental religious architecture, the ingenuity and creativity of the region find expression. These structures were designed to encompass functionality, spiritual meaning, and beauty, an expression of basic precepts of Islamic architecture while expressing regional adaptation unique to Central Asia.

The early Islamic architectural identity in Central Asia began to take shape under the Samanid dynasty—that is, between 819 and 999. The most important building of this period is the Samanid Mausoleum in Bukhara, a structure representing early experiments with materials where innovative uses of baked brick arranged in geometrical patterns showed not just structural ingenuity but sophisticated aesthetic sensibility. The compact, cubic shape with its domed roof expressed the mastery of spatial organization and symmetry, setting a precedent for later architectural achievements.

Further development in techniques and styles was brought by the 11th-through-13th-century Seljuk dynasty. The Seljuk architects introduced the wide application of iwans—vaulted halls with arched openings—to religious and civic buildings. This feature became something of a hallmark of Central Asian architecture, where it gave both functional and symbolic elements to religious complexes. During the Seljuk period, there was an increase in the use of tile mosaics and stucco decorations that enhance the visual and spiritual experiences of the worshippers.

The 14th and 15th centuries were indeed a period of great architectural stride in the Timurid era. Under Timur and his successors, cities such as Samarkand and Herat developed into something of a cultural and architectural beauteousness. The Registan Square in Samarkand represents the climax of Timurid architectural innovation with its grand madrasas decorated with bright tilework and soaring domes. Of course, the use of double-shelled domes, monumental gateways, and unrivaled mastery over tile decoration during this period left almost indelible marks on the architectural identity of the Islamic world.

All these eras, architects, and artisans responded to the serious environmental challenges in their designs. The susceptibility of earthquakes spawned advanced engineering techniques in this region, including thick walls and reinforced foundations to stabilize the structures. More importantly, due to the harsh climate with its aridity, there developed an incorporation of courtyards, shady iwans, and ventilation systems in the religious complexes that had increased their functionality and comfort.

The monumental architecture of the Samanid, Seljuk, and Timurid dynasties gave expression to the spiritual, political, and cultural aspirations of their creators and patrons, which became symbols of this tenure. Built as focal points for urban life, these buildings nurtured community cohesion and intellectual exchange [7]. Their designs and innovations would resound far beyond the region in the realm of Islamic architecture across the Middle East, South Asia, and even parts of Europe Table 1.

Table 1. Central Asian Architectural Development

Dynasty	Key Contributions	Legacy
Samanid Dynasty (819–999)	This is the period that initiated the Islamic architectural identity in Central Asia. Its significant contribution is, first, the Samanid Mausoleum in Bukhara, an example of early experimentations with baked brick arranged into complex geometries. The compact, cubic form with a domed roof demonstrated masterful control over spatial organization and symmetry, establishing architectural standards for future dynasties.	The Samanid period was a base for Islamic architecture in Central Asia, where new techniques and aesthetics were introduced in building structures, influencing later architectural achievements. These structures symbolize spiritual aspirations and identity of culture.
Seljuk Dynasty (11th–13th centuries)	In their turn, the Seljuks took over and innovated architecturally by adopting the overall characteristics of iwans—the vaulted halls with arch-headed openings of religious and civic buildings. The intricacy of tile mosaics, stucco decorations, and calligraphy was expanded. Their buildings reflected a balance between function and symbolism for spiritual and aesthetic experiences in view.	The Seljuks brought about innovations in architecture that became the hallmarks of Islamic architecture and directed designs in the Middle East and Central Asia. Their blending of functionality with artistry set a precedent for incorporating symbolic elements into practical structures.
Timurid Dynasty (14th–15th centuries)	Central Asian architecture had reached its climax under Timur and his successors. The greatest example of the Timurid epoch is the Registan Square in Samarkand with its large madrasahs covered with bright tilework, double-shelled domes, and monumental gateways. The mastery of using polychromatic tiles was an art the Timurids perfected, making them visually and symbolically bringing out a design that was heavy in meaning for both grandeur and spiritual elevation.	The Timurid period is the apogee of Central Asian architectural sophistication and has bequeathed an artistic legacy to Islamic architecture around the world. Their designs influenced styles in South Asia, the Middle East, and elsewhere. The cultural and artistic innovations of this era continue to inspire admiration and scholarly research.

ARCHITECTURAL TECHNIQUES

Dome Construction and Structural Engineering

One of the major features defining Central Asian religious architecture is the great dome—characteristically a symbol for the heavens and one of the biggest symbols of the architectural heritage of Islam itself. The local builders there succeeded in perfecting that revolutionarily new method called double-shell doming, so great was the need that these massive structures represented—for both grandeur and stability. It involved building an inner shell for structural support and an outer shell for aesthetic prominence, thereby creating domes that were light and soaring yet strong against seismic activity in the region.

And it is in that transition from the square or rectangular base of a building to the circular form of a dome where the ingenuity of these architects really came in. They used squinches—arched or corbelled corners—and pendentives, triangular segments of a sphere, to smoothly distribute the weight of the dome

onto the square base. Most of these techniques exhibited greater knowledge in geometry and engineering in constructing such iconic domes meant for permanence. For example, the dome of the Bibi-Khanym Mosque at Samarkand still stands and is a wonder of the technical skills of Timurid architects.

But the symbolic function of domes deepened their architectural meaning. Made to represent the cosmos and the infinite nature of the divine, these structures were meant to evoke feelings of awe and a sense of spiritual elevation among the worshippers. Most of the double-shell domes were covered with glittering tilework in shades of turquoise and azure, which, sparkling in sunlight, would carry the celestial metaphor even further Figure 1.

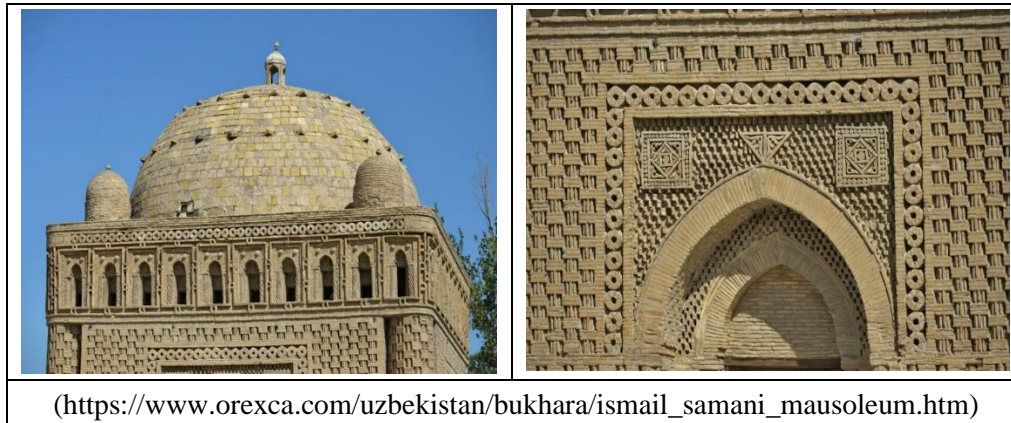


Figure 1. Samanid Mausoleum, Bukhara

Intricate Brickwork and Tile Decoration

In Central Asia, the skill of builders was at its height in adorning brickwork, elevating an ordinary construction material into an art form. Baked bricks were aligned into complex geometric patterns in religious structures, serving to give the buildings structural integrity and aesthetic appeal but also greatly symbolizing unity and infinity, mirroring spiritual concepts from Islam.

Apart from brickwork, there were the glazed ceramics and tile mosaics in vivacious colors that decorated mosques, madrasas, and mausoleums. They would generally represent floral designs, arabesques, and calligraphic quotations from the Qur'an, making the atmosphere within these edifices alluring and spiritual. The Timurids were unrivaled in the use of polychromatic tiles that combined shades of blue, green, and gold in visually striking compositions Figure 2.

Yet, the artistry went beyond aesthetic pleasure alone, since these decorations had functional benefits as well; the glazed tiles protected the building from weathering, while the reflective surfaces were used to brighten up interiors with natural light. Probably the most magnificent example is the Registan in Samarkand, representing some of the finest tile work to be found in the Islamic world.

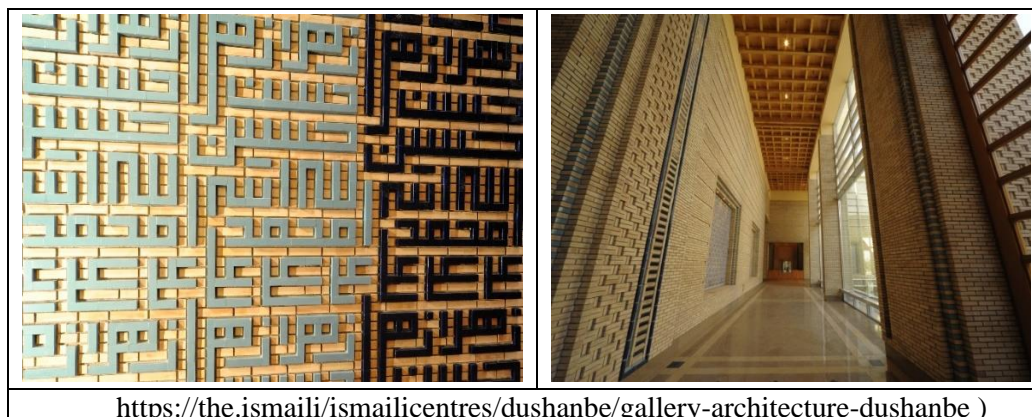


Figure 2. Ismaili Centre, Dushanbe

Integration of Courtyards and Iwans

Another feature of Central Asian architecture was the inclusion of courtyards and iwans in religious complexes. Those spaces performed both functional and symbolic roles in that they were used for communal prayer, gathering, and teaching. The open courtyards provided a place for quiet contemplation and offered relief from the region's extreme climate, while the iwans helped create comfort with their shade.

Architects also paid attention to iwan orientation, making sure it underlined the direction of Mecca. This orientation further stressed the spiritual emphasis of the spaces and further underlined the call for unity in Islamic worship. The iwans themselves were further adorned with intricate muqarnas—that is, those stalactite-like decorations—and tilework, bringing them visually into masterpieces.

Similarly, the inclusion of courtyards and iwans demonstrated an understanding of environmental adaptation. They allowed natural ventilation and lighting and reduced the consumption of artificial cooling and lighting, respectively, thus being sustainable in the surroundings. The best examples are the Kalyan Mosque at Bukhara and Ulugh Beg Madrasa at Samarkand. All these elements are summarized through a composition epitomized at its best. Courtyard of the Po-i-Kalyan Mosque in Bukhara (16th century), looking towards the iwan that leads to the maqsura shown in Figure 3.

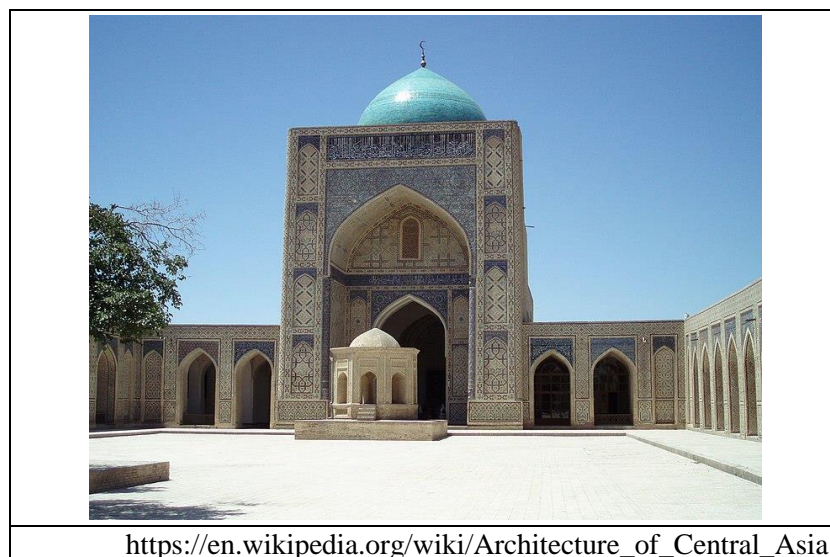


Figure 3. Courtyard of the Po-i-Kalyan Mosque in Bukhara (16th century), looking towards the iwan that leads to the maqsura

Use of Local Materials and Adaptation to Environment

Availability of local materials like baked clay, mudbrick, and natural stone had a great influence on Central Asian architectural styles. The techniques of the builders were developed to extremely difficult environmental conditions of the region, creating resilient structures, which at the same time were sustainable. Thick mudbrick walls provided excellent insulation, keeping the interior cool in summer and warm in winter. Elevated platforms protected the buildings from flooding and soil erosion, ensuring their longevity.

These adaptations extended to the use of domed roofs and vaulted ceilings, which helped in distributing weight evenly and increased resistance to seismic activity. Further, windows and vents passing through at strategic points provided natural ventilation and reduced the humidity level inside to maintain a comfortable indoor climate.

The focus on sustainability did not come at the expense of aesthetics; builders had worked in such a manner that the ornamental aspects were well carried out within the functional designs, evidencing deep knowledge of the relation between form and purpose. In the same breath, local materials gave religious

structures in Central Asia a special visual identity with earthy tones and complex patterns, harmonizing well with the environment.

Cultural and Symbolic Significance

The architectural techniques of the religious buildings in Central Asia were meant to serve more than one purpose; it held deep symbolic meanings and cultural values. The buildings were supposed to be houses of worship, but more so, they were supposed to represent the spiritual and intellectual level of the people who constructed them. Every single element in the architecture would have multiple layers of symbolism within it, contributing to a holistic representation of Islamic culture and its values.

Domes, characteristic of the religious architecture of Central Asia, symbolize the celestial sphere and the infinite nature of the divine. Placed in plan and dimension to be insurpassing in nature, to somehow make the worshipper jump towards the Infinite, they almost always have inside an arrangement of stars or calligraphic inscriptions representing something divine, illustrating omnipresence and conciliation on heaven and earth.

Wall and façade decorations carried visual or symbolic representations of Islamic teaching and cultural ideals. Calligraphic inscriptions, usually carrying verses from the Quran, were intended to enhance the sanctity of a place and carried spiritual messages. Geometric patterns and arabesques were symbolic of unity and order in the universe and thus depicted the main principles of Islam: balance and harmony. Not only were these ornaments beautiful, but they were so deeply rooted in the local culture and religion.

Apart from their religious significance, these structures served equally as centers of scholarship and cultural exchange. Due to their location, various mosques and madrasas in Central Asia turned into great seats of learning to which scholars, students, and wayfarers are attracted from far and near within the Islamic world. The grandiose architecture of the buildings underlines their importance; the new bloom of culture and knowledge interchanged here gives light to the science of Islamic Golden Age.

In this way, religious buildings in Central Asia remain alive as testimony to the well-developed cultural heritage in which art, function, and spirituality interplay subtly.

CONCLUSION

The religious architecture of Central Asia is a wonderful testimony to the high cultural heritage, technical ingenuity, and artistry of the region. These structures, built during the height of Islamic civilization, testify to the degree of creativity and craftsmanship possessed by the builders of Central Asia, who integrated local traditions with Persian, Islamic, and other cultural sources in complete harmony. From big domes, which are symbolizing the heavens, to the fine brickwork and brilliant tile mosaics ornamenting their exterior, these buildings speak in harmonious unity in form, function, and spiritual meaning.

Features such as double-shell domes and the latest techniques of making the transition from square bases to circular domes manifestly show a high grade of culture because builders must have highly skilled knowledge of engineering and geometry. These architectural features were more than simple structural solutions; they carried deep symbolic meanings that resonated throughout the spiritual and cultural values of the Islamic world. And similarly, through its ornate calligraphy, geometrical patterns, and floral motifs, it turned functional spaces into aesthetic masterpieces with the function of carrying Islamic teachings and cultural ideals.

These Central Asian religious structures were far more than their aesthetic and technical achievements; they had been vital centers of learning and cultural exchange. Also, at a later period, mosques, madrasas, and mausoleums were acting as the intellectual activity centers with the arrival of scholars and students seeking knowledge for the spread of knowledge all over the Islamic world. Their great architecture was symbolic to their role as spiritual sanctuaries and cultural beacons in society, creating legacies that continue rising today, which are a subject of veneration in concern by scholars.

However, the preservation of these architectural treasures presents an urgent challenge. Most of them suffer from the environment, lack of maintenance, and loss through urban development. Indeed, the call is in order for future research studies and conservation attempts so as to ensure the safety of this architectural heritage to posterity. It is only through continued research and preservation of such works that we are able to pay homage to creators while ensuring that the deeper cultural and historical significance of Central Asian religious architecture will be a source of inspiration for centuries to come.

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